

Mortgage Finance: Why Not PLAM's?

By Joyce Manchester

Homeownership is an important social and political goal in the United States. Attainment of this goal, however, does not come easily for a large portion of the population. Buying a house represents a major purchase for most families, requiring borrowed funds to finance most of the sales price. To expand the opportunities for homeownership, a system of mortgage finance has developed to serve the needs of borrowers and to encourage the participation of lenders.

For many years, the standard fixed-rate mortgage (FRM) was satisfactory to both borrowers and lenders. Throughout the 1950s and 1960s, a stable economic environment contributed to widespread acceptance of the long-term, fixed-payment contract. In light of the increased economic uncertainty in recent years, however, the standard mortgage is no

longer as satisfactory, especially to lenders. The adjustable-rate mortgage (ARM) is one innovation introduced by lenders to reduce the risk they must bear in making mortgage loans. But many borrowers find the risks of fluctuating payment levels difficult to accept. As a result, alternative forms of mortgages may be needed to meet the needs of both borrowers and lenders in the current uncertain economic environment.

This article argues that the price-level-adjusted mortgage (PLAM) is preferable to both fixed-rate and adjustable-rate mortgages in the current economic environment and could become the dominant form of mortgage finance if certain institutional impediments were removed. The first section explains the problems of standard FRM's in the current economic environment. The second section shows that ARM's, though preferable in many ways to fixed-rate mortgages, pose the threat of undue default risk. The third section argues that PLAM's are preferable to both FRM's and ARM's because they ease the problems of standard mortgages without increasing default

Joyce Manchester is an assistant professor of economics at Dartmouth College and a visiting scholar at the Federal Reserve Bank of Kansas City. The views expressed in this article are those of the author and do not necessarily reflect the views of the Federal Reserve Bank of Kansas City or the Federal Reserve System.

risk unacceptably. The final section shows that while PLAM's are desirable under current conditions, their adoption is impeded by institutional factors.

Problems with the standard mortgage

To promote the social goal of homeownership with greatest economic efficiency, the method of mortgage finance should have four major characteristics. First, it should allocate the risk of unexpected interest rate changes between borrowers and lenders so that risk is not unduly burdensome to either party. Though mortgage contracts cannot by themselves eliminate interest rate risk, the terms of the contract can provide efficient sharing of that risk. Second, eligibility requirements established to qualify for a mortgage loan should take account of future as well as current financial conditions of prospective borrowers. In particular, households whose income at the time they want to buy a home is lower than their likely future income should not as a consequence be ruled out as qualified borrowers. Third, the fraction of income required to meet mortgage payments should accord with consumers' desired lifetime consumption patterns. Most theoretical models of consumer choice suggest that this condition will be fulfilled if the ratio of mortgage payments to income is relatively constant over the term of the mortgage. Finally, the risk of the borrower defaulting on the loan should be minimized. Since there are real economic costs to both borrowers and lenders from loan defaults, mortgage contracts should be designed so default is avoided whenever possible.

The inadequacies of standard fixed-rate mortgages with respect to these four characteristics have become apparent in recent years. When inflation was low and interest rates sta-

ble, as in the 1950s and 1960s, the deficiencies of standard mortgages were hidden by the favorable economic environment. As a result, fixed-rate mortgages did not substantially impair the efficient flow of funds to homebuyers. As interest rates and inflation increased and became more variable over the past decade, however, the problems of standard fixed-rate mortgages became increasingly evident.

Interest rate risk

A major problem with FRM's is that lenders bear all the interest rate risk. Whenever credit is extended over a long period at a constant nominal interest rate, there is the possibility that actual market rates of interest will differ over the term of the loan from those expected when the loan was made. When this happens, the revenue generated on a lender's loan portfolio differs from the cost of attracting funds to keep the institution active in credit markets. During periods of unexpectedly high interest rates, both lenders' profits and net worth decline. The lender clearly loses.¹

The problems caused by the lender bearing the interest rate risk can be easily illustrated. Suppose that, during an extended period of interest rate stability, lenders acquire large portfolios of fixed-rate mortgages at 8 percent, while paying 7 percent on their deposits. Now

¹ During periods of unexpectedly low nominal interest rates, on the other hand, the lender gains at the expense of the borrower. Most emphasis in this article is on the effects of unanticipated increases in nominal interest rates for two reasons. First, recent experience has been with unanticipated increases in market rates, not decreases. Second, the loss to borrowers resulting from unanticipated decreases in nominal interest rates can be avoided through use of the prepayment option. Under this option, borrowers can refinance their loans whenever they desire.

For a good description of the value of the prepayment provision, see Arden R. Hall, "Valuing the Mortgage Borrower's Prepayment Option," Federal Home Loan Bank of San Francisco, WP 9-584.

suppose there is a general unanticipated increase in interest rates. While the interest rate on outstanding mortgages remains unchanged, suppose that the rate on new mortgages increases to 10 percent, while the deposit rate rises to 9 percent.

Over the short run, such an unanticipated increase in interest rates has deleterious effects on the lender's cash flow. Existing mortgages are being repaid at an 8 percent annual rate, while the lender must pay 9 percent to attract funds. If the institution cannot offer the current market rate, investors will move their funds elsewhere. The institution has cash-flow problems as long as market interest rates remain higher than the interest received on its mortgage portfolio.

Lending institutions have even more serious problems over the long run as the rate earned on assets and the cost of funds continue to diverge. Disintermediation, the large-scale withdrawal of funds from financial institutions, prevents new loans generating higher rates of return from being made. The net worth of the institution suffers as the market value of existing loans declines with the increase in interest rates. No investors would pay the full price for a loan with an 8 percent return when new loans with a 10 percent return are available. Thus, with an unexpected increase in interest rates, the lender could face both cash-flow problems and net worth problems.

The design of the fixed-rate mortgage contract implies that lenders bear all interest rate risk regardless of the source of the risk. Under FRM's, whether risk results from unanticipated increases in the real rate of interest or from unanticipated increases in inflation, lenders lose and borrowers gain.²

Recent experience shows the problems caused by mortgage lenders bearing all interest rate risk. Large declines have occurred in the

net worth and profit margins of mortgage lending institutions due to unexpectedly high nominal interest rates. The thrift industry, which accounts for more than half of the outstanding mortgage debt held by private financial institutions and holds most of this debt in FRM's, has been especially affected.³

In contrast to the adverse impact on mortgage lenders, standard mortgages offer clear-cut benefits to mortgage borrowers during periods of unexpectedly high interest rates. For example, households that took out mortgage loans in the 1960s, when interest rates were low, enjoyed large capital gains in the 1970s and early 1980s as interest rates trended upward. The capital appreciation can be seen most clearly for borrowers with assumable mortgage loans having rates below those prevailing in the market. Because buyers are willing to pay a premium price on houses with loans that can be assumed at favorable rates, individuals holding such loans experienced an increase in the market value of their property as mortgage rates rose. Even individuals with unassumable loans benefited indirectly from holding FRM's because their house payments were lower than if they were to buy an identical house with funds from a loan at the higher market interest rates. Thus, all past borrowers

² For an analysis of the return on a nonindexed financial asset during times of unexpected inflation, see Stuart E. Weiner, "Why Are So Few Financial Assets Indexed to Inflation?" *Economic Review*, Federal Reserve Bank of Kansas City, May 1983, pp. 3-6.

³ According to the Federal Home Loan Bank Board, the total worth of the nation's savings and loan associations eroded by \$4.6 billion in 1981, or by 15 percent, and a \$4.3 billion loss was accrued in 1982. Federal regulators arranged a record 23 mergers of failing savings and loans into healthier institutions in 1981. Such mergers had to be stopped in 1982 because the Federal Savings and Loan Insurance Corporation could no longer afford to finance them. Mutual savings banks lost \$1.4 billion in 1981, and the Federal Deposit Insurance Corporation spent \$1.7 billion arranging nine mergers in 1982.

benefited from holding a fixed-rate mortgage loan during the 1970s.

The picture for prospective borrowers, however, was not so bright during the late 1970s. Having experienced liquidity and net worth problems as a result of past interest rate increases, lending institutions became more cautious in making fixed-rate loans. One aspect of this increased caution may have been an increased risk premium included in mortgage rates to protect against further increases in nominal interest rates. Thus, prospective borrowers may well have been charged a higher interest rate to compensate lenders for bearing the entire risk of interest rate changes.

Mortgage eligibility

A second problem with standard mortgages is that they make it very difficult for households to qualify for a loan during times of high and volatile interest rates. The interest rate on FRM's must be high enough to reflect current and expected short-term interest rates plus a risk premium to protect the lender against future unexpected increases in short-term interest rates. These high interest rates increase monthly payments and the risk of default. To screen out households subject to high default risk, mortgage lenders look carefully at the ratio of mortgage payments to income. If this ratio is too high, the risk of default is excessive and the loan is not approved. As mortgage rates rise, then, it becomes more difficult for borrowers to qualify for mortgages. In particular, younger households that have not reached their full earning potential often cannot qualify on current income. Because U.S. capital markets generally preclude borrowing against expected future earnings, these households are either shut out of the housing market or forced to buy lower priced houses.

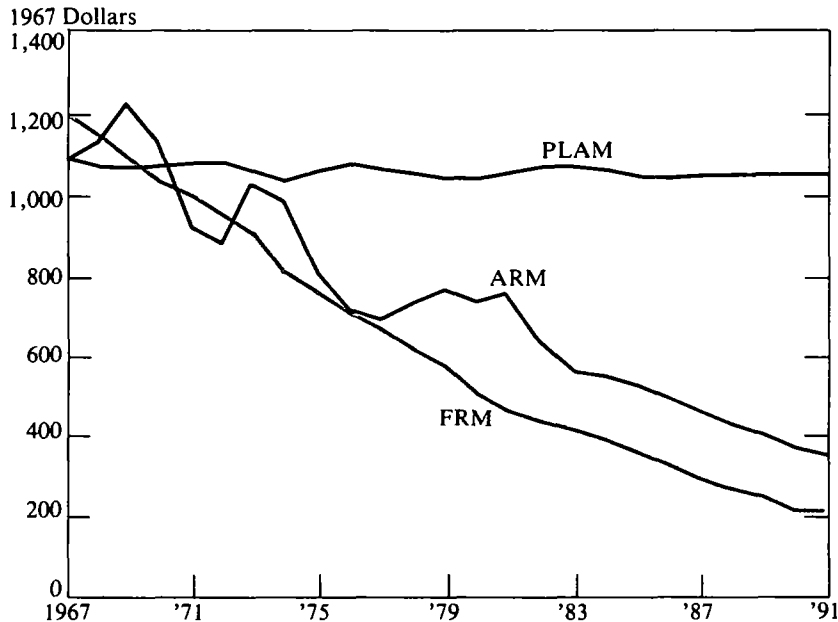
Tilt

A third problem with FRM's is that the real burden of mortgage payments typically declines steadily over the term of the mortgage during inflationary periods. One reason for this "tilt" in the real burden of mortgage payments is that inflation causes a decline in the real, or inflation-adjusted, value of a fixed mortgage payment. The tilt in the real value of mortgage payments is depicted in Chart 1 for a hypothetical FRM issued in 1967. The mortgage is assumed to be a 25-year mortgage for \$15,000 with a fixed 6.5 percent rate. As can be seen in the chart, inflation would have reduced the real value of payments by over 50 percent between 1967 and 1983. Assuming inflation continues, further erosion in the real value of mortgage payments would continue thereafter, with the real value of payments in the final year perhaps only about 25 percent of the real value in the first year.⁴

A second reason for a tilt in the real burden of mortgage payments is that real incomes typically increase over time. Increasing real income reduces the burdensomeness of making mortgage payments of constant real amounts. Thus, when growing real incomes accompany relatively high inflation, as has

⁴ The Federal Home Loan Bank Board *Journal*, Table S.51, December 1977, reports the average maturity on new home loans was 25.1 years in 1970. The National Association of Realtors began reporting the median house price on sales of existing single-family homes in 1968, when the median price was \$20,100. Assuming a 75 percent loan-to-value ratio, the initial principal value is \$15,000 for 1967. The 1984 *Economic Report of the President*, Table B-67, reports the new-home mortgage yield on conventional mortgages was 6.46 percent in 1967. Actual inflation between 1967 and 1982 is measured by the personal consumption expenditure deflator. Estimates of expected inflation generated by a vector autoregressive procedure are used as deflators between 1983 and 1991. The estimates begin at 5.0 percent in 1983, increase to 7.5 percent in 1986, then gradually decline to 6.8 percent in 1991.

CHART 1
Real payment values for hypothetical mortgage contracts



been the case in recent years, the ability to make mortgage payments increases even as the real value of those payments declines. As a result, the real burden of a fixed nominal mortgage payment would be even more skewed than is indicated by the example in Chart 1 if account is taken of increasing real incomes over time.

Many young households that are establishing careers or taking on the responsibilities of children are not likely to prefer the tilt in the real burden of mortgage payments. Theoretical models of consumer choice over the life-cycle indicate that the greatest utility comes from a constant real level of consumption.⁵ These

⁵ James Tobin and Walter Dolde, "Wealth, Liquidity, and Consumption," in *Consumer Spending and Monetary Policy*. Federal Reserve Bank of Boston, Boston, 1971, pp. 99-160.

same models suggest that most households would prefer housing expenditures that were a fairly constant share of income.⁶ The severe tilt in the real burden of payments with fixed-rate mortgages is counter to this preference.

Default risk

The one attractive feature of the standard FRM is that it has low and declining default

⁶ Assuming a time-invariant utility function, households will prefer a constant ratio of real housing consumption to real permanent income over time. Borrowing constraints and transactions costs imply that the highest possible level of housing services is optimal at the outset, suggesting again that real housing expenditures should be spread into the future rather than decline over time. For a more complete analysis, see Joyce Manchester, "Evidence on Possible Default and the Tilt Problem Under Three Mortgage Contracts," Federal Reserve Bank of Kansas City, RWP 84-08, August 1984.

risk over the life of the contract. Because nominal mortgage payments are constant, there is no possibility that “payment shock” will lead to default. Moreover, the tilt factor means that payments decline over time relative to income, thereby reducing the risk of default. These favorable features with regard to default risk may be one reason fixed-rate contracts historically have been so prevalent despite their other shortcomings.

The advantages of the standard mortgage contract regarding default risk are a consequence of its disadvantages in other respects. The allocation of all interest rate risk to the lender implies that unexpected changes in interest rates do not lead to unexpected variability in nominal mortgage payments, thereby minimizing the chance of default. Because the ratio of payments to income typically declines over time and eligibility tests are based on initial income levels, default risk declines over the term of the mortgage.

Advantages and disadvantages of the adjustable-rate mortgage

Adjustable-rate mortgages (ARM's) have several advantages over the standard fixed-rate mortgage. Because they force the borrower to bear more interest rate risk, however, they could have excessive default risk.

Under an ARM, the interest rate is tied to some current nominal interest rate, such as the yield on U.S. Treasury securities or the cost of funds to savings and loan associations. The resulting change in the mortgage interest rate gives rise to periodic payment adjustments, with the frequency ranging from every six months to every five years.

An example corresponding to the previous example for a FRM illustrates how interest rate risk is shifted to the borrower with an ARM. As in the previous example, the mort-

gage is assumed to be a 25-year loan for \$15,000 issued in 1967. The mortgage rate is assumed to be lower—5.5 percent rather than 6.5 percent—because the lender does not need to charge an interest rate risk premium on the ARM. The mortgage rate in this example is indexed to the 6-month U.S. Treasury bill rate, with both the rate and the payments adjusted annually. Under this contract, as shown in Table 1, mortgage payments would total \$1,101 in 1967. A year later, the Treasury bill index had increased by 0.8 percentage points, so the mortgage rate would increase to 6.3 (5.5 + 0.8) percent. As a result, mortgage payments would rise to \$1,190 in 1968, or \$89 more than in 1967. Thus, nominal payments increase during the period shown for the ARM, in contrast to the steady nominal payments for the standard mortgage.

The increase in nominal payments would enable lenders to pay a market rate to attract funds. This would alleviate the lenders' cash-flow and net worth problems that result when the increased cost of funds is not matched by an increased rate of return on assets, as is the case with standard mortgage contracts. By issuing ARM's, the lender receives a rate of return that moves in step with market rates of interest.

While the liquidity and net worth problems experienced by lenders under a standard mortgage are shifted to the borrower under the ARM, the problem of qualifying for a loan is less severe for ARM's than for the standard mortgage. Because the initial interest rate is lower, more households are eligible for mortgage financing on a given size loan at the lower payment level, and problems caused by the inability to borrow against expected increases in income are eased.

The adjustable-rate mortgage does not eliminate the problem of tilt, however. Chart 1

TABLE 1
Principal, interest rate, and payment
for hypothetical mortgage contracts

	<u>Year</u>	<u>Standard Mortgage</u>	<u>Adjustable- Rate Mortgage</u>	<u>Price-Level- Adjusted Mortgage</u>
Outstanding Principal	1967	\$15,000	\$15,000	\$15,000
	1968	14,750	14,710	15,078
	1969	14,485	14,439	15,413
	1970	14,201	14,200	15,789
Mortgage Interest Rate	1967	6.5%	5.5%	5.5%
	1968	6.5	6.3	5.5
	1969	6.5	7.7	5.5
	1970	6.5	7.4	5.5
Nominal Payment	1967	\$1,210	\$1,105	\$1,105
	1968	1,210	1,190	1,132
	1969	1,210	1,339	1,182
	1970	1,210	1,308	1,238
Real Payment	1967	\$1,210	\$1,101	\$1,105
	1968	1,163	1,143	1,105
	1969	1,112	1,230	1,105
	1970	1,063	1,148	1,105

Note: See footnote 4 for explanations and sources of assumptions used in constructing these hypothetical mortgage contracts.

shows the decline in real ARM payment values over the life of a loan based on assumptions comparable with those of the standard mortgage. As for the FRM, the tilt would be even more pronounced if account were taken of increasing real incomes. Thus, the ARM is still subject to the same tilt problem as standard mortgages.

The increase in the risk of default when interest rates are rising is a serious concern regarding ARM's. Not only do nominal payments rise as market interest rates rise, but real payments may increase if the nominal index rate adjustment is more than current inflation. As shown by Chart 1, real payments fluctuate much more under the ARM than under the fixed-rate mortgage. Real payments

increased sharply between 1967 and 1969 and between 1972 and 1973 as Treasury bill rates rose more than measured inflation. Such payment increases, if not expected by households, could have put financial strains on them, perhaps resulting in defaults. Although real income growth would ease the "payment shock," the timing of payment adjustments relative to income adjustments is crucial. Some nominal incomes might be fixed by three-year contracts, for example, while mortgage payments changed every six months.

The possibility of severe default risk stems directly from the ARM characteristics. Any unanticipated increases in nominal interest rates lead to sharp nominal payment adjustments not always matched by contemporane-

ous increases in nominal incomes. Eligibility tests cannot anticipate the burden of such payment increases in a satisfactory fashion. While the overall decline in the ratio of payments to income augurs well for default risk in the long run, there is substantial risk of default during the early years of the loan.

Adjustable-rate mortgages issued today often differ from the pure ARM. Many include payment caps or rate caps to limit the change in payments. About 40 percent of the ARM's issued by savings and loans, commercial banks, and mortgage banks in the first six months of 1983 had such caps.⁷ These caps, motivated in part by a desire to reduce the risk of default, limit the borrower's interest rate risk in the short run by shifting part of the risk back to the lender. Unless the lender absorbs the costs exceeding allowable adjustments, however, limiting the payment or rate adjustment only increases the value of the loan to be repaid in the future.

ARM's with caps can cause cash-flow shortages for lending institutions. Mortgage payments may not be adequate to cover the full monthly interest cost when interest rates are rising. In that case, negative amortization may occur, with the principal value increasing from one period to the next. As long as the rates or payments are fully adjusted by the time the loan term is completed, however, the solvency of lending institutions is not threatened.

Recent developments in mortgage markets suggest that caps on interest rate adjustments may become more widespread. The Federal National Mortgage Association (FNMA) announced in April 1984 that it would not purchase ARM's from lending institutions unless

they limited interest-rate adjustments to two percentage points a year. In setting this standard, FNMA was trying to reduce the payment shock resulting from sharp upward adjustments in nominal interest rates. In so doing, it is encouraging lenders to share the interest rate risk that has long plagued nominal mortgage contracts.

Advantages of price-level-adjusted mortgages

Price-level-adjusted mortgages combine the best features of fixed-rate and adjustable-rate mortgages. They are designed to perform well even during periods of uncertain and variable economic conditions. As a result, the system of mortgage finance would function more efficiently if this type of contract were adopted.

Unlike FRM's and ARM's, both of which allocate all of the interest rate risk to one party or the other, the PLAM allows interest rate risk to be shared between borrowers and lenders. Real rate risk, arising from unexpected changes in the real rate of interest, is allocated to the lender. An unexpected increase in demand for credit by businesses, households, or the government not matched by an increase in the supply of credit, for example, could cause an unexpected increase in the real rate of interest. Inflation risk, arising from unexpected changes in the inflation rate, is allocated to the borrower. Unexpected increases in energy prices or a setback in food production, for example, could lead to an unanticipated rise in the inflation rate.

The allocation of interest rate risk is accomplished under PLAM's by allowing the outstanding principal to vary with the general price level, rather than tying the mortgage interest rate to some reference rate as under ARM's. The mortgage rate is a fixed real rate. During periods of inflation, periodic upward

⁷ Federal Home Loan Mortgage Corporation, "What Makes an ARM Successful? A Report on the Market for Adjustable Rate Mortgages," Publication No. 53C, 1984.

reevaluation of the outstanding balance leads to increases in nominal mortgage payments. Real payments, however, remain constant. The rise in nominal payments protects the lender against increases in interest rates caused by inflation, while the constant real payments protect the borrower against increases in interest rates caused by real factors.

A simple example illustrates how nominal payments increase and real payments remain constant under PLAM's. Consider a \$100 mortgage with 25 years to maturity issued on the first day of Year 1. Assume for simplicity that both real rates and inflation rates remain constant at 5 percent for the entire term of the loan. Monthly payments in Year 1 would total \$6.96. Of this amount, \$2.01 would go to amortizing the principal. The principal remaining on the last day of Year 1 then would be adjusted upward by the percentage change in the price level to compute the new principal outstanding on the first day of Year 2. The new principal would be \$102.89 $[(100 - 2.01) \times 1.05]$. The 5 percent real interest rate is again applied to the new principal to yield the sum of monthly payments in Year 2, which would total \$7.32. The real value of mortgage payments would remain the same in the second year, since \$7.32 expressed in Year 1 dollars is equal to \$6.96. The process continues until Year 25 when the loan is paid off. Thus, throughout the term of the mortgage, nominal payments would increase at the same rate as the overall price level, keeping real payments constant.⁸

By allocating real rate risk to the lender and inflation rate risk to the borrower, the PLAM improves on the problem of interest rate risk as compared with both the FRM and the

ARM. For example, Table 1 shows a PLAM comparable with the FRM and ARM discussed previously—a 25-year mortgage for \$15,000 issued in 1967. Because the lender can protect itself against real rate risk, the interest rate is assumed to be the same as for the ARM, 5.5 percent. Mortgage payments in the first year under the PLAM would total \$1,105. The principal at the end of 1967 would be \$14,712, and this is adjusted by the rate of inflation, 2.5 percent, as measured by the percentage change in the personal consumption expenditure deflator. The 5.5 percent real rate is applied to the adjusted principal of \$15,079 $(14,712 \times 1.025)$ to calculate total mortgage payments in 1968. Nominal payments in 1968 would total \$1,132, having the same real value as mortgage payments in 1967. Since the lender bears the real rate risk, payments are not affected if the real rate of interest rises. The borrower does pay more in nominal terms, however, when inflation increases.

The difference in the levels of nominal and real mortgage payments for the PLAM as compared with the standard mortgage or ARM is seen clearly in Table 1. While nominal payments increase from \$1,105 to \$1,238 between 1967 and 1970 under the PLAM, the nominal payment levels remain constant at \$1,210 under the standard mortgage and fluctuate between \$1,105 and \$1,339 under the ARM. The pattern of real payments is markedly different, however. The real value of PLAM payments remains constant at \$1,105, while the real value of standard mortgage payments falls from \$1,210 to \$1,063 and the real value of ARM payments fluctuates between \$1,101 and \$1,230.

Under PLAM's, interest rate risk would be absorbed by the party most capable of doing so. The upward trend in real personal income shows borrowers are better able to handle inflation risk than lenders. Due to this upward

⁸ Even in the more realistic case in which the inflation rate varies, the PLAM keeps real payments constant.

trend, constant real payments would not be burdensome for most households. On the other hand, hedging opportunities open to institutions, but not most individuals, allow lenders to protect themselves at least partially against real rate risk. Lenders have access to futures contracts for foreign exchange, Treasury bills, and other assets. These instruments allow banks to limit the variability in real returns on their portfolios. In addition, if secondary mortgage markets for PLAM's existed, the inflation-adjusted principal could be sold to generate additional cash flow. Households, on the other hand, cannot use futures markets effectively because of the large minimum denomination of most futures contracts.

In addition to a better sharing of interest rate risk, the PLAM offers advantages relative to both FRM's and ARM's in terms of the ease of qualifying for a mortgage, especially in periods of high expected inflation. Since the mortgage rate applied to the principal represents only the real rate, there is no adjustment for expected inflation as in other mortgage contracts. Nor is there any inflation risk premium. In general, the real interest rate on a PLAM will be lower than the nominal interest rate on a FRM or ARM. With the lower interest rate, payments for a given size loan are also lower, making it easier for households to show they are eligible for loans.

Also, the PLAM ameliorates the tilt in the burden of making mortgage payments that characterizes both fixed-rate and adjustable-rate mortgages. With a PLAM, tilt exists only to the extent that real incomes are growing. Inflation itself does not lead to a decrease in the real value of mortgage payments as for FRM's and ARM's, as can be seen in Chart 1. According to most models of consumer choice, many households would prefer this pattern of constant real payments. It would especially be preferred by younger households

facing many demands on relatively low incomes but expecting increases in real incomes later. Also, lenders could rely on a constant stream of real payments, regardless of actual inflation. This assurance enhances long-run planning and profitability.

Finally, the problem of excessive default risk that plagues ARM's is substantially reduced with a PLAM. As Chart 1 shows, real payments under the PLAM are relatively constant over time. The small variations arise from divergence of the mortgage index rate (adjusted by movements in the Treasury bill rate) from actual inflation (measured by the percentage change in the PCE deflator). Although the real payments are greater than with a standard mortgage or an ARM after the first four years, there are no increases in real payments comparable with the increases under an ARM. As a result, real payment shock that poses severe risk of default with an ARM is eliminated altogether with a PLAM. Households, however, must expect higher nominal mortgage payments during times of inflation. Because borrowers' income would increase at about the same rate as mortgage payments, however, the increase in nominal mortgage payments would not cause unacceptable default risk.

Prospects for the adoption of PLAM's

Both economic conditions and institutional arrangements are important in providing an environment conducive to the PLAM. Recent economic trends have favored adoption of indexed contracts. Although few PLAM's have been issued, the likelihood of these trends continuing could spur both demand by borrowers and supply by lenders.⁹ Some institutional impediments would need to be removed, however, before these mortgages are adopted on a large scale.

The desirability of PLAM's

Economic conditions play an important role in establishing a need for indexed contracts. As long as real rates and inflation rates are not volatile, neither borrowers nor lenders are much concerned about the costs of bearing interest rate risk. Also, when interest rates are low, fewer households have problems qualifying for a mortgage or making mortgage payments.

Recent trends in price volatility, real income growth, and market rates of return, however, suggest that more interest in PLAM's might be expected. Economic models suggest that an increase in price volatility makes inflation-indexed contracts more attractive to borrowers, provided two conditions exist.¹⁰ First, real incomes must continue increasing with prices. Second, the real market rate of return must vary inversely with prices. Because both of these conditions seem to have held throughout most of the past 30 years, and because price instability has increased in recent years, borrowers presumably would prefer PLAM's to nominal rate contracts.¹¹

⁹ The Utah State Retirement Board issued PLAM's in 1981 at the real rate of 4.5 percent. Weiner reports that PLAM's had been offered in three other states.

¹⁰ Stanley Fischer developed models of the index bond market applicable to ultimate borrowers and lenders that were adapted to apply to the mortgage market by Manchester. See Fischer, "The Demand for Index Bonds," *Journal of Political Economy*, Vol. 83, No. 3, 1975, pp. 509-34, in which the demand for index bonds arises from households who maximize utility and have the choice of investing in real bonds, equity, and nominal bonds. Fischer, "Corporate Supply of Index Bonds," NBER Working Paper No. 331, March 1979, presents a capital asset pricing model in which corporations supply index bonds as they seek to maximize profits. Manchester, "The Market for Housing and House Prices in the U.S.," Harvard Ph.D. thesis, 1982, adapts these models to the supply of and the demand for PLAM's in a world of households and financial intermediaries.

¹¹ Zvi Bodie, "Common Stocks as a Hedge Against Inflation," *Journal of Finance*, Vol. 31, No. 2, May 1976, pp. 459-70.

Evidence that price variability has increased substantially in recent years is shown in Table 2. The variance and the coefficient of variation of the consumer price index (CPI) and the personal consumption expenditure (PCE) deflator increased markedly in the 1970s and especially in the five-year period ending in 1983. In light of this increase in the variability of inflation, borrowers could be expected to prefer PLAM's. By the same reasoning, the relatively low variability in the earlier years helps explain the previous lack of interest in such instruments.¹²

Lenders also should prefer inflation-indexed mortgages when inflation is more variable. Because the real value of PLAM payments remains constant over time, the real rate of return to lenders holding PLAM assets remains constant over time. This is especially important given the recent deregulation of rates payable by banks and savings and loan associations on deposits. As deposit interest rates become more closely linked to variable market interest rates, the protection provided by PLAM's against declines in the rate of return on mortgage assets will be increasingly valuable. Without this protection, the rate of return adjusted for inflation becomes highly uncertain, thereby hindering long-run planning.

Impediments to adoption

Lack of consumer understanding is a major barrier to PLAM acceptance. Borrowers must be willing to accept inflation risk and forego the advantages that accrue to them under fixed-rate mortgages when inflation is unexpected. While increases in nominal payments

¹² Again see Stuart E. Weiner, "Why Are So Few Financial Assets Indexed to Inflation?" for a more complete analysis of the nonexistence of inflation-indexed instruments.

TABLE 2
Measures of inflation variability

<u>Period</u>	<u>CPI</u>		<u>PCE Deflator</u>	
	<u>VAR</u>	<u>CV</u>	<u>VAR</u>	<u>CV</u>
1954-83	13.949	3.035	8.261	1.961
1954-58	2.300	1.506	1.202	0.657
1959-63	0.141	0.110	0.409	0.249
1964-68	1.863	0.650	1.433	0.536
1969-73	4.918	0.906	2.255	0.465
1974-78	7.803	0.974	5.975	0.836
1979-83	20.698	2.446	8.474	1.190

Note: VAR is the variance of the annual percentage growth for each of the price indexes from December to December. CV is the coefficient of variation for each of the price indexes, defined to be the variance of the annual percentage growth divided by the mean percentage growth.

could be a hardship to borrowers who do not expect the increase or whose incomes do not keep pace with inflation, the advantages of PLAM's should outweigh the disadvantages for most borrowers.

The deductibility of nominal interest payments from individual income taxes provides another impediment. The impediment arises because lower real interest payments under a PLAM as compared with nominal interest payments under a FRM or ARM result in less tax savings. Particularly during the early years of a nominal-rate mortgage, when most of the mortgage payment is interest, households in high tax brackets holding a FRM or ARM benefit from a large reduction in the after-tax cost of housing. According to current practice, only the real interest payments on the fluctuating principal of a PLAM could be deducted. The result would be a smaller proportional decline in the after-tax cost of borrowing and less absolute tax savings.¹³ This difference will remain as long as nominal interest payments are deductible or until tax laws are changed to provide more equitable treatment.

The difference between the rate of return

earned on PLAM's and the rate paid on deposits at lending institutions presents a third impediment and perhaps the most serious problem. Because the interest rate financial institutions pay on their deposits is a nominal interest rate while the interest rate received on PLAM's is a real interest rate, the rate of return on PLAM's during times of inflation would be considerably less than the rate paid on deposits. A severe cash-flow problem could result if the institution could not generate cash flow from other sources or change the nature of its liabilities.

This impediment caused by the mismatch between revenues and payout could be overcome through increased use of secondary markets or the introduction of inflation-indexed deposits. To generate additional cash flow, the

¹³ Joseph McKenzie, an economist at the Federal Home Loan Bank Board, confirmed that the real interest payment based on the current nominal outstanding principal of the PLAM was deductible. For a discussion of four possibilities for tax treatment of PLAM's, see Richard Peiser, Kenneth Ferris, and Robert Rene, "Income Taxation and Price-Level-Adjusted Mortgages," *Housing Finance Review*, Vol. 2, No. 1, January 1983, pp. 1-18.

increased value of the mortgage principal could be sold on the secondary market after each principal revaluation. Although such an effort would require considerable paperwork and the capital gain would be taxed when the increase in principal was sold, the liquidity of the lending institution would be enhanced. Alternatively, to improve the match between income and payment flows, price-level-adjusted deposits could be used instead of nominal deposits as the financial institution's main type of liability. In other words, a real interest rate could be paid on inflation-adjusted deposit balances.¹⁴

A fourth impediment to the adoption of PLAM's is the inability of lending institutions to establish a perfect hedge against real rate risk. Because the real rate on a 25-year PLAM is fixed over the life of the mortgage, any increase in the market real rate of interest means an increase in the cost of funds not matched on the revenue side. One possible solution to this risk involves hedging in the financial futures market. The use of foreign exchange futures together with Treasury securities futures has been mentioned as an imperfect hedge subject to exchange rate risk. Better hedging methods are attainable, however. If a CPI futures contract were available, lending institutions could invest in Treasury bill futures offset by CPI futures to guarantee a specific real rate of return over a given investment period. The Commodity Futures Trading Commission is investigating the possibility of a CPI futures contract presently.¹⁵

¹⁴ The probability of withdrawal would still threaten short-term cash flows, but this threat could be eased by increasing the proportion of fixed-term deposits relative to those that have no stated term to maturity.

¹⁵ Both political and legal problems must be overcome before the CFTC will approve the CPI futures contract. I am grateful to James Culver at Merrill Lynch Commodities for useful discussion of this issue.

The legal intricacies of the index mortgage could be the biggest stumbling block. Every state has its own laws concerning lien priority—who has claim to what part of the asset in case of default. In most states, the future increases in the inflation-adjusted principal might not belong to the lending institution. This situation complicates title insurance, with the result that this insurance may not be available for houses financed through price-level-adjusted mortgages.

Conclusion

Price-level-adjusted mortgages would improve the efficiency of the mortgage finance system by allocating each component of interest rate risk—real rate variability and the inflation rate variability—to the party best able to bear it. Lending institutions, with their access to hedging opportunities, secondary mortgage markets, and a variety of sources of funds, would bear all the risk of real rate fluctuation. Households, whose incomes tend to more than keep pace with inflation over time, would bear all the inflation risk. Moreover, by eliminating the tilt associated with nominal interest rate contracts, the stream of real payments remains constant over the life of the mortgage, improving long-run financial planning without posing unacceptable default risk.

Several changes would need to be made before PLAM's are widely adopted. Borrowers and lenders must be willing to accept this type of contract. Tax laws would need to be altered to provide more favorable treatment of interest payments by borrowers. The cash flow of lenders receiving revenues in real terms while making deposit payments in nominal terms would need to be altered either by restructuring liabilities or by hedging. Finally, the legal problems of lien priority and title insurance would need to be resolved.

Despite these problems, several factors indicate that the price-level-adjusted mortgage could become the dominant mortgage contract. Adjustable-rate mortgages with interest rate caps or payment caps are becoming more common as borrowers and lenders try to reduce the payment shock accompanying unexpected increases in interest rates. At the same time, concern over defaults resulting from excessive fluctuations in nominal pay-

ments associated with these adjustable-rate mortgages has become widespread. In addition, financial institutions continue seeking new ways of adapting to changing economic conditions. Price-level-adjusted mortgages have the advantages of the sharing of interest rate risk between borrower and lender, constant real mortgage payments over time, reasonable eligibility requirements, and an acceptable level of default risk.